

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 1 512 527 A1

(12)

## EUROPEAN PATENT APPLICATION

(43) Date of publication:

09.03.2005 Bulletin 2005/10

(51) Int Cl.7: B31B 7/14, B31B 17/00,

B31B 7/26, B31B 7/60,

B65D 3/06, B65D 3/22

(21) Application number: 04254628.3

(22) Date of filing: 31.07.2004

(84) Designated Contracting States:

AT BE BG CH CY CZ DE DK EE ES FI FR GB GR  
HU IE IT LI LU MC NL PL PT RO SE SI SK TR

Designated Extension States:

AL HR LT LV MK

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(30) Priority: 14.08.2003 US 640705

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### (54) Multilayer container and method and blank therefor

(57) The present invention provides a single wrap container (110) and a method for forming such a container (110) and a blank (100) therefor. The blank (100) and, hence, the container (110) are formed of a multilayer web (90) that has an inner liner ply (70) and an outer label ply (80), each adhered to opposite sides of

a paper ply (60), which can be recycled paper. The multilayer web (90) is cut to a predetermined shape, for example, using a rotary die (30), thereby forming the blank (100). The container (110) can then be formed by singly wrapping the blank (100) so that helical wrapping is not required and a seam (118) formed by joining the edges (102,104) of the blank (100) is linear.

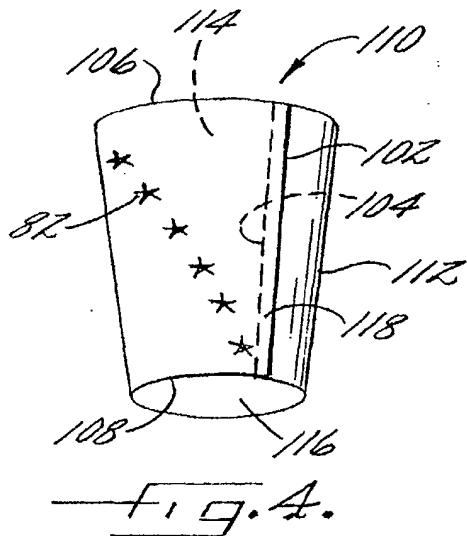


FIG. 4.

**Description****BACKGROUND OF THE INVENTION****1) Field of the Invention**

**[0001]** This invention relates to a container having a multilayer sidewall that is singly wrapped and a method for forming such a container.

**2) Description of Related Art**

**[0002]** A variety of multilayer structures are conventionally used for forming containers. Such structures can include layers formed of paper, polymers, metallic foils, and the like, depending on the intended use of the container. For example, interior liners can be formed of moisture and gas barrier materials, such as plastics and metals, for containers used for food products.

**[0003]** According to one conventional method of forming containers, the multiple plies of the multilayer structure are wound helically on a cylindrical mandrel, with the plies overlapping so that a continuous cylindrical tube is formed. As the plies are disposed on the mandrel, glue is provided between the plies, and the tube is compressed radially inward on the mandrel so that the plies are adhered. The plies can be continuously disposed on the mandrel as the formed tube is slid axially along the mandrel, and the tube is then cut, either on or off the mandrel, to form short cylindrical tube sections. The ends of each tube section can be closed, for example, by gluing or frictionally fitting a round cap to each end. The structure of the container is determined by the type and order of the plies that are disposed on the mandrel. The size is determined by the diameter of the mandrel and the interval between the cuts. However, non-cylindrical shapes can be difficult or impossible to form with such a method, especially shapes with non-uniform cross sections. Further, the helical seam extending around the resulting container can detract from the aesthetic appeal of the container, and can complicate pre-printing of the outer surface of the outer ply of the container.

**[0004]** Thus, there exists a need for an improved container and a method for forming the container. Preferably, the container should be formed of a multilayer structure that provides a moisture and/or gas barrier and can be formed at least partially of recycled materials such as recycled paper. The method should not require helical wrapping, and the resulting container should not have a helical seam. Further, the method should be useful for forming containers of varying shapes, including non-cylindrical shapes and shapes with non-uniform cross sections. Finally, the method should be compatible with pre-printed label materials to provide a container that is aesthetically appealing.

**BRIEF SUMMARY OF THE INVENTION**

**[0005]** The present invention provides a single wrap container and a method for forming such a container and blanks therefor. The container is formed from a multilayer web having liner and label plies adhered on opposite sides of a paper ply. The multilayer web is cut with a die. The resulting die cut blank can be substantially flat and configured to be wrapped, or bent, to form the single wrap container.

**[0006]** According to one embodiment of the present invention, the paper ply can be recycled paper, which can be covered on either side by the liner and printed label plies. The multilayer web can be conditioned, for example with heat and pressure, and then cut with the die or first coiled into a roll. The label can be printed before or after being adhered to the paper ply.

**[0007]** The blank can also be bent to form a container, such as for food packaging. For example, the blank can be bent about 360 degrees, and first and second edges of the blank can be joined to form a linear interface. The first and second edges of the blank can be nonparallel so that the resulting container defines a space that is at least partially conical. At least one end of the container can be closed with an end member.

**[0008]** Thus, the container can be formed of a multilayer web sidewall that extends circumferentially between first and second edges joined at a seam. The sidewall has a paper ply with a liner ply adhered to the inner side and a label ply adhered to the outer side. The liner and label plies can be formed of polymers, and the label ply can be opaque and can have indicia on an outer surface. Thus, the multilayer web can include recycled paper while providing a moisture and/or gas barrier. Further, the label ply can be preprinted and can substantially cover the outer surface of the paper ply to provide aesthetic appeal for the container. In addition, the blanks can be singly wrapped to form containers of various sizes and shapes with substantially linear, i.e., non-helical, seams.

**BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS**

**[0009]** Having thus described the invention in general terms, reference will now be made to the accompanying drawings, which are not necessarily drawn to scale, and wherein:

**50** Figure 1 is an elevation view of an apparatus for forming a container according to one embodiment of the present invention;

Figure 2 is a plan view of the apparatus of Figure 1; Figure 3 is a plan view of a blank formed according to one embodiment of the present invention; and Figure 4 is a perspective view of a container formed from the blank of Figure 3 according to one embodiment of the present invention.

## DETAILED DESCRIPTION OF THE INVENTION

**[0010]** The present invention now will be described more fully hereinafter with reference to the accompanying drawings, in which some, but not all embodiments of the invention are shown. Indeed, the invention may be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will satisfy applicable legal requirements. Like numbers refer to like elements throughout.

**[0011]** Referring now to the figures and, in particular, Figures 1 and 2, there is shown an apparatus 10 for forming blanks 100 and containers 110, such as can be used for food packaging, according to one embodiment of the present invention. The illustrated apparatus 10 can be used to continuously adhere liner and label plies 70, 80 to a paper ply 60, condition the resulting multilayer web 90, cut the multilayer web 90 to form blanks 100, and configure the blanks 100 into containers 110. In other embodiments, however, the multilayer web 90 or the blanks 100 can be stored and used to form the containers 110 at a location or time other than immediately subsequent to the formation of the multilayer web 90. For example, the multilayer web 90 can be formed and wound in rolls or coils, or the blanks 100 can be cut and stacked or otherwise stored.

**[0012]** The paper, liner, and label plies 60, 70, 80 can be provided as rolls of material, as shown in Figure 1. The particular material used for each ply 60, 70, 80 can vary and can be determined according to the intended contents and environment of the container 110, weight and strength requirements, printing or other aesthetic requirements, the cost and availability of materials, and the like. For example, the paper ply 60 can be paper-board that is formed partially or entirely of recycled paper. The liner ply 70 can be formed of a moisture resistant layer, which can also act as a gas barrier. For example, the liner 70 can be a lamination of polyethylene, aluminum foil, polyethylene, and Kraft paper. The Kraft paper, which can be extensible Kraft, is disposed against the paper ply 60, and the first polyethylene layer is directed away from the paper layer 60. The label ply 80 can be formed of paper, polymers, foil plies, and the like. For example, the label 80 can be formed of 40 pound clay-coated one-side (C1S) Kraft paper, with the clay-coated side directed away from the paper ply 60.

**[0013]** In one embodiment, the label 80 is a substantially opaque ply so that the color or other visual characteristics of the paper ply 60 are not readily visually apparent by viewing the outside of the container 110. For example, the paper ply 60 can be formed of brown recycled paper, and the label ply 80 can cover the paper ply 60 so that the appearance of the container 110 is not affected, or only marginally affected, by the paper ply 60. The label ply 80 can be printed or otherwise provided with indicia 82 such as graphics or text for purposes of identifying the contents of the container 110, improving

the aesthetic appearance of the container 110, and the like. If the label ply 80 is opaque, an outer surface of the label ply 80 can be printed. Further, the label ply 80 can be printed before, after, or during the forming of the container 110. For example, the label ply 80 can be printed before being adhered to the paper ply 60, after the blank 100 has been formed, or after the container 110 has been formed from the blank 100. Various methods can be used to print the label 80, as are known in the art. In addition, the label ply 80 can be printed in a width larger than that used in the apparatus 10 and then cut to the desired width before being adhered to the paper ply 60.

**[0014]** The liner and label plies 70, 80 are adhered to the paper ply 60, for example, by applying an adhesive to one or more of the plies 60, 70, 80 so that the adhesive is disposed between the paper and liner plies 60, 70 and between the paper and label plies 60, 80. As shown in Figure 1, the adhesive can be applied by adhesive applicators 12, 14 to a first side of the paper ply 60 that is directed toward the liner ply 70 and to a side of the label ply 80 that is directed toward the paper ply 60. Alternatively, the adhesive can be applied to both sides of the paper ply 60 or to a side of the liner ply 70 that is directed toward the paper ply 60. With the adhesive disposed between the plies 60, 70, 80, the resulting multilayer web 90 can be passed through a nip 16 defined by two rollers 18a, 18b. The rollers 18a, 18b can be configured to apply a compressive force on the plies 60, 70, 80 so that the adhesive is disposed evenly and the multilayer web 90 is substantially uniform in thickness. Alternatively, the liner and label plies 70, 80 can be adhered to the paper ply 60 by other methods, for example, by heating the plies 70, 80 and laminating the plies 70, 80 on the paper ply 60 with a pre-applied thermoplastic polymer that bonds the plies 70, 80 to the paper ply 60.

**[0015]** The multilayer web 90 then proceeds to a conditioning unit 20, where the web 90 is heated or otherwise processed to promote uniform drying of the adhesive. The conditioning unit 20 can be a conventional oven, with convection air flow, through which the multilayer web 90 can be passed continuously. The multilayer web 90 may be passed through another nip defined by rollers 22a, 22b to further consolidate and make uniform the web 90. Additional rollers (not shown) can also be provided in the conditioning unit 20. Further, the conditioning unit 20 can spray water or otherwise introduce moisture to the web 90. Thus, the conditioning unit 20 can be used to adjust a moisture content of the web 90 to a predetermined moisture level, thereby affecting the stiffness and pliability of the web 90.

**[0016]** The multilayer web 90 is cut to form the blanks 100, i.e., pieces of the multilayer web 90 having a pre-defined shape, each of which can be configured to form one of the containers 110. The multilayer web 90 can be cut shortly after and continuously with the conditioning, as shown in Figures 1 and 2. Alternatively, the multilayer web 90 can be wound to form rolls of material that can be cut at another time and/or using a machine that

is located remotely from the adhering and conditioning devices 12, 14, 20. According to one advantageous embodiment of the present invention, a rotary die 30 is configured to cut the multilayer web 90 to form the blanks 100. The rotary die 30 can include opposed rollers 32, 34 that define a nip 36 therebetween, and at least one of the rollers 32 can define an outer cutting surface 38 that defines a cutting feature 40, such as a raised portion that corresponds in shape to the blank 100. The other roller 34 can define a correspondingly opposed cutting feature (not shown) that contacts or receives the cutting feature 40 of the first roller 34. The rollers 32, 34 are rotated as the multilayer web 90 is passed therebetween such that the multilayer web 90 is urged against the outer cutting surface 38, the cutting feature 40 is impressed into or through the multilayer web 90, and the web 90 is thereby cut to the desired shape of the blank 100. The rotary die 30 can be used to cut the multilayer web 90 into the blanks 100 as the web 90 is passed continuously through the die 30. Alternatively, other cutting devices can also be used for cutting the web 90. For example, the blanks 100 can be cut using reciprocating dies, punches, flying blades or saws, and the like. Further, the cutting device can be integral to one of the other components of the apparatus 10. For example, the cutting device can be integral to a wrapping device 50, described further below, so that the multilayer web 90 can be formed and delivered directly to the wrapping device 50, where a reciprocating die (not shown) cuts the web 90 to the desired dimensions.

[0017] The multilayer web 90 can be formed to have a width that is only slightly larger than a width of each blank 100. Such a "single line" narrow web can be cut with a rotary die inline with the forming process and fed to the wrapping device 50, or the web 90 can be fed directly into a wrapping device that is equipped to cut the blanks 100 from the web 90. Alternatively, the width of the multilayer web 90 can be greater than the width of the blanks 100 so that multiple blanks 100 can be cut from the width of the web 90. For example, two blanks 100 can be cut from the width of the web 90, as shown in Figure 2. The blanks 100 can be fed directly into the wrapping device 50 or taken offline and fed to the wrapping device 50 at a later time. In any case, the rotary die 30 or other cutting device can be configured to minimize the amount of excess or scrap material 42. For example, each of the two blanks 100 simultaneously cut by the rotary die 30 shown in Figure 2 is oriented oppositely relative to the other blank 100.

[0018] Each blank 100 can be cut completely from the multilayer web 90 and the excess material 42 from the multilayer web 90 can be removed and deposited in a receptacle 44 for recycling or disposal. The resulting blanks 100, which can be substantially flat, are deposited onto a conveying device 46 such as a continuous conveyor belt. The conveying device 46 can deliver the blanks 100 directly to a wrapping device 50, as shown in Figures 1 and 2. Alternatively, the blanks 100 can be

stacked and stored for subsequent use in a wrapping device remote to the forming apparatus 10. Additionally, features can be provided on the blanks, for example, by folding or rolling the edges, depositing coatings or additional layers of material on the blanks, printing the blanks, and the like.

[0019] The blanks 100 shown in Figure 3 are substantially flat and extend between first and second converging edges 102, 104. Transverse ends 106, 108 of the blanks 100 are curved. Thus, the illustrated blanks 100 can be bent, i.e., wrapped, folded, or otherwise configured to form a sidewall 112 of a container 110 that is at least partially conical and defines an interior space 114. By the term "at least partially conical," it is meant that a portion of the container 110 defines at least part of a cone, e.g., a frustocone. In one advantageous embodiment of the present invention, the blanks 100 are bent about 360 degrees to form the single wrap container 110, i.e., the first edge 102 of the blank 100 is bent about 360 degrees to form a sidewall 112 of a tubular shape that defines an inner space 114 therein. For example, the first edge 102 can be joined to the second edge 104 by heat sealing or otherwise adhering the two edges 102, 104 to form a seam 118 that extends substantially linearly along the container 110. The tubular shaped sidewall 112 can be conical or frustoconical to define a circular cross section, or the sidewall 112 can have a cross section that defines a shape of another polygon, for example, a square, rectangle, triangle, and the like. Further, the sidewall 112 can define one or two open ends, which can be closed by attaching an end member, such as a bottom member 116 or a cap, to one or both of the open ends. For example, the blanks 100 can be used to form the frustoconical sidewall 112 of the container 110 shown in Figure 4, such that the container 110 can receive part of a similar container for stacking. Alternatively, the blanks 100 can be bent to form containers 110 of other configurations, having uniform or non-uniform cross sections.

[0020] The wrapping device 50 is configured to bend the blanks 100 to form the containers 110. For example, the wrapping device 50 can fold the blanks 100, wind the blanks 100 around a mandrel, or otherwise bend the blanks 100. Various devices can be used for forming the container 110. For example, the wrapping device 50 can be a single wrap package forming machine such as the BMP 200 Paper Cup Machine made by Michael Hörauf Maschinenfabrik GmbH & Co. KG of Donzdorf, Germany, which can be used to bend each blank 100, seal the edges 102, 104, and attach the bottom member 116 thereto. Further, the wrapping device 50 can be configured to cut the blanks 100 from the web 90 so that the web 90 can be fed directly from the conditioning device 20 to the wrapping device 50, i.e., without being first cut in a rotary die 30 or other cutting device.

[0021] Many modifications and other embodiments of the inventions set forth herein will come to mind to one skilled in the art to which this invention pertains having

the benefit of the teachings presented in the foregoing descriptions and the associated drawings. Therefore, it is to be understood that the invention is not to be limited to the specific embodiments disclosed and that modifications and other embodiments are intended to be included within the scope of the appended claims. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation.

## Claims

1. A method of constructing a single wrap container, the method comprising:

providing a paper ply having first and second opposite sides;  
adhering a liner ply to the first side of the paper ply and a label ply to the second side of the paper ply to thereby form a multilayer web;  
cutting the multilayer web with a die to form a substantially flat blank for forming the single wrap container; and  
bending the blank and joining first and second edges of the blank to form a single wrap container defining an interior space.

2. A method according to Claim 1 wherein said providing step comprises providing paperboard formed at least partially of recycled paper.

3. A method according to Claim 1 wherein said adhering step comprises substantially covering the first and second sides of the paper ply.

4. A method according to Claim 1 wherein said adhering step comprises disposing an adhesive between the liner ply and the paper ply and between the label ply and the paper ply and passing the multilayer web through a nip formed by opposing rollers.

5. A method according to Claim 1 further comprising coiling the multilayer web after said adhering step to form a roll before said cutting step.

6. A method according to Claim 1 further comprising heating the multilayer web and thereby conditioning the multilayer web to adjust a moisture content of the web to a predetermined level.

7. A method according to Claim 1 further comprising printing indicia on the label before said adhering step.

8. A method according to Claim 7 wherein said printing and adhering steps comprise printing a first side of the label ply and adhering a second side of the label

ply to the paper ply such that the first side of the label ply is directed away from the paper ply.

9. A method according to Claim 1 wherein said cutting step comprises cutting more than one blank from a width of the multilayer web.

10. A method according to Claim 1 wherein said cutting step comprises urging the multilayer web against an outer cutting surface of a rotary die and rotating the rotary die.

11. A method according to Claim 1 wherein said bending step comprises bending the blank to form a linear interface between the first and second edges of the blank.

12. A method according to Claim 1 wherein said bending step comprises bending the blank by about 360 degrees to form the single wrap container.

13. A method according to Claim 1 wherein said cutting step comprises cutting the multilayer web to define the first and second edges of the blank in a nonparallel configuration, and wherein said bending step comprises bending the blank to form the container such that the container is at least partially conical.

14. A method according to Claim 1 further comprising attaching at least one end member to the container, thereby closing at least one end of the container.

15. A method of forming a blank for use in constructing a single wrap container, the method comprising:

providing a paper ply having first and second opposite sides;  
adhering a liner ply to the first side of the paper ply and a label ply to the second side of the paper ply to thereby form a multilayer web; and  
cutting the multilayer web with a die to form a substantially flat blank for forming the single wrap container.

16. A method according to Claim 15 wherein said providing step comprises providing paperboard formed at least partially of recycled paper.

17. A method according to Claim 15 wherein said adhering step comprises substantially covering the first and second sides of the paper ply.

18. A method according to Claim 15 wherein said adhering step comprises disposing an adhesive between the liner ply and the paper ply and between the label ply and the paper ply and passing the multilayer web through a nip formed by opposing rollers.

19. A method according to Claim 15 further comprising coiling the multilayer web after said adhering step to form a roll before said cutting step. 5

20. A method according to Claim 15 further comprising conditioning the multilayer web to adjust a moisture content of the web to a predetermined level. 10

21. A method according to Claim 15 further comprising printing indicia on the label before said adhering step. 15

22. A method according to Claim 15 wherein said printing and adhering steps comprise printing a first side of the label ply and adhering a second side of the label ply to the paper ply such that the first side of the label ply is directed away from the paper ply. 20

23. A method according to Claim 15 wherein said cutting step comprises cutting more than one blank from a width of the multilayer web. 25

24. A method according to Claim 15 wherein said cutting step comprises urging the multilayer web against an outer cutting surface of a rotary die and rotating the rotary die. 30

25. A single wrap container formed from a blank, the container comprising:  
a multilayer web sidewall extending circumferentially between first and second edges joined at a seam, the sidewall having a paper ply with first and second opposite sides, a liner ply adhered to the first side of the paper ply and a label ply adhered to the second side of the paper ply, the sidewall being singly wrapped such that the seam is substantially linear. 35

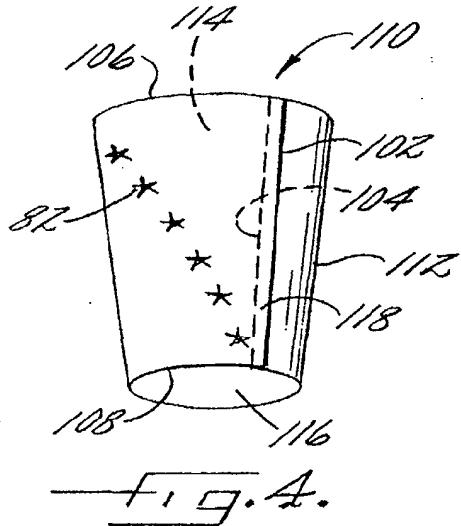
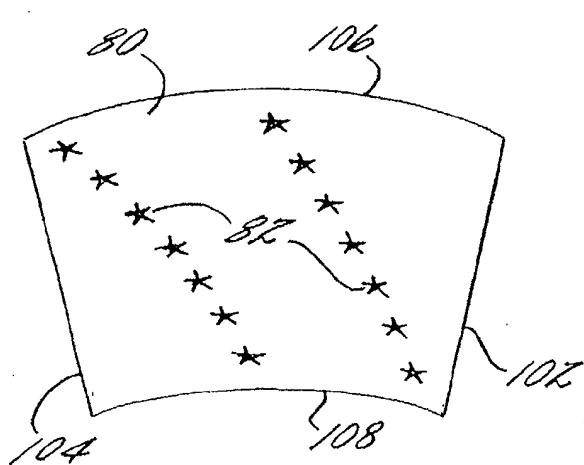
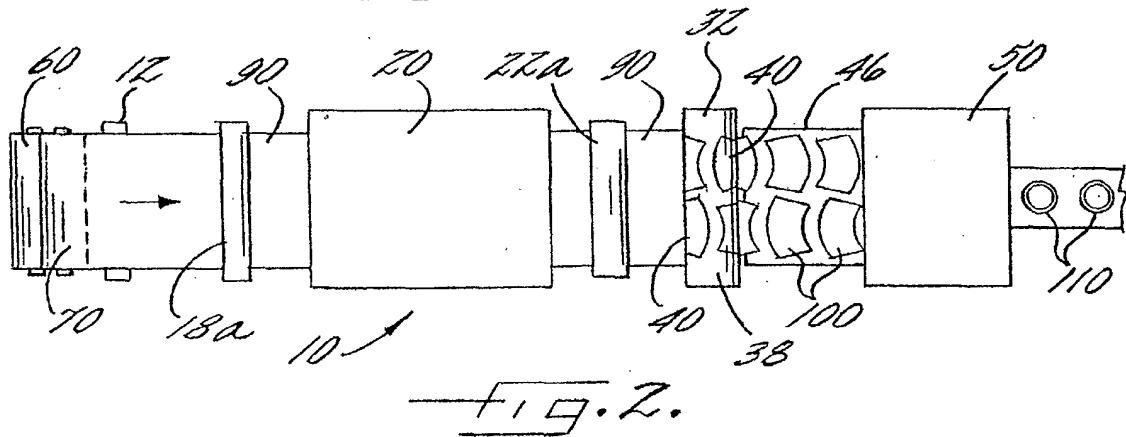
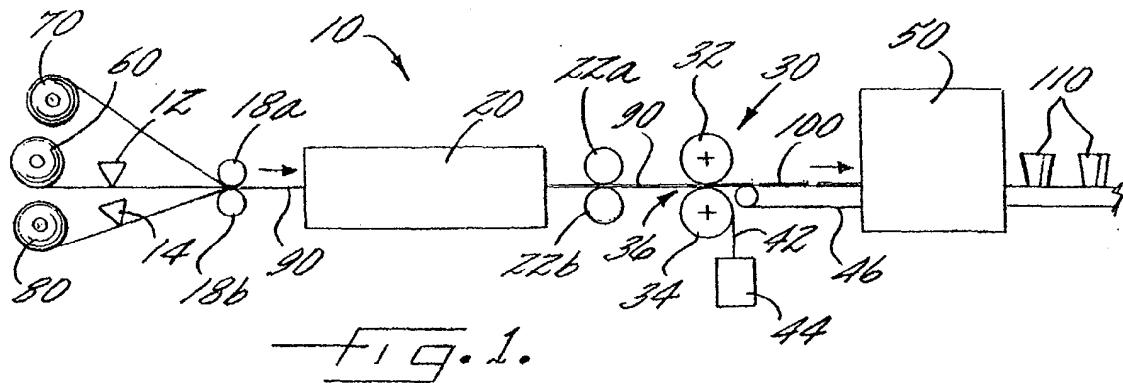
26. A container according to Claim 25 wherein the paper ply is formed at least partially of recycled paper. 40

27. A container according to Claim 25 wherein the liner and label plies substantially cover the first and second sides of the paper ply. 45

28. A container according to Claim 25 wherein the label ply is opaque and defines indicia printed on an outer surface thereof. 50

29. A container according to Claim 25 further comprising an end member joined to the sidewall to at least partially close the container. 55

30. A container according to Claim 25 wherein at least one of the liner and label plies are formed of a polymer.





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Application Number  
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1	Place of search The Hague	Date of completion of the search 15 December 2004	Examiner Sundell, O
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ON EUROPEAN PATENT APPLICATION NO.

EP 04 25 4628

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